

Danthonia



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FOG on the plains

A new community group for Australia's most threatened plant communities

by Edwina Barton*

A new community group determined to seek a better deal for lowland native grassland ecosystems was launched in Canberra last November.

Friends of Grasslands (FOG) saw its initial charter as supporting such ecosystems in the ACT and surrounding areas of NSW. But interest from further afield suggests that there could be a role for FOG to act as a wider information clearing house in future, perhaps providing a vehicle for the exchange of ideas relevant to the community on lowland native grasslands anywhere in Australia.

After only a few weeks FOG's membership reached nearly 100, indicating a strong interest in grassland issues from many sectors of the community and from several states.

FOG's overall aim is to convince the wider community that grasslands matter, and thereby to enlist community support for the conservation of remnant grassland ecosystems.

In the ACT region, as in other parts of Australia, lowland

grasslands are prime targets for urban development - their flatter, more low-lying character makes them a planner's and developer's dream. Strong community support is therefore essential if government is to be persuaded to hold them back from development.

And there is little time to lose. For instance, as the ACT Minister for the Environment, Land and Planning pointed out when launching FOG, none of the ACT's original treeless grasslands are in reserves, despite the fact that 92 % of those grasslands have already been lost.

Nationally the situation is even worse, in terms of percentage lost. Since Captain Cook landed, around 99.5 % of lowland grasslands in the south-east of Australia have been either totally destroyed or badly degraded.

In pursuing broad community support for lowland grasslands, FOG will be looking very widely at the benefits and applications of grassland species, including agricultural, horticultural and landscaping uses.

Asking the community to

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EDITORIAL

It has been said that one of the problems in getting public and media interest for conservation is that it's the 'megas' that catch the imagination. Mega-fauna; the rhinos and pandas and even our own cuddly marsupials always make good press. But try stirring the public's imagination (and pockets) for a campaign to preserve an endangered moth or leech! It's the same with 'mega-plants'. Coloured flowers make attractive pictures and we all love trees. So it's good to see grasslands receiving more attention. Edwina Barton explains why native grasslands have become Australia's most threatened plant communities. It's timely that the Australian Nature Conservation Agency has issued a brochure *Grasslands in Australia*. Members will receive a copy with this issue of *Danthonia*.

Regional reports take up a fair swag of this issue, and that's important. ANPC evolved from a conference called 'Protective Custody - ex situ plant conservation in Australasia'. The early thoughts of the ANPC's founding fathers were that Australia needed an organisation to coordinate the work of botanic gardens in Australia. But just prior to that conference, and certainly afterwards, our views changed. Integrated plant conservation became the target that we were aiming for. And community involvement was integral to that. It's good to see so much interest by ANPC members and others in regions around Australia to get things moving and to network (if you'll forgive me using that word as a verb!).

This is my last *Danthonia* since I'm leaving the ANBG, to take up a position with the Endangered Species Unit of ANCA. I'll still be involved with plant conservation as I will be helping with the administration of the Commonwealth Endangered Species Protection Act; with meetings and

workshops on a range of topics related to species and habitat conservation; and through some of the recovery plans funded by the Endangered Species Program.

It's been a pleasure to meet, correspond with and speak on the telephone to so many people who are concerned about, and deeply committed to, the conservation of Australia's natural environment. It's been a pleasure, too, to work with Mark Richardson, Geoff Butler (who has now also left ANBG), Jeanette Mill, and our pleasant and long-suffering volunteer clerical assistant, Jeanne Trebeck. It's safe to say that without the commitment, dedication and drive of Mark Richardson the ANPC would not have made the progress it has. Mark has spent many hours in directors' offices, pleading for money and facilities and getting the support of ANBG's parent agency, ANCA. Mark has been the one who has prepared proposals for funding to enable us to employ consultants on contract to achieve many of the goals that ANPC has set itself. And during the past year, Jeanette has been an enthusiastic and dedicated extension officer, generating enthusiasm among members so that as I write there are now 5 regional groups of ANPC in existence, with more in the pipeline.

So it's farewell to the palatial ANPC

office suite and hello to the concrete jungle. I have been at the Australian National Botanic Gardens for a long time; indeed the Gardens has changed its name three times during my time there! And in that time I can say that I have definitely seen evidence of evolution. Not so much amongst my colleagues, but certainly in the way botanic gardens see their role in conservation. Things are going the right way. Cheers!

Lyn Meredith

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back grasslands on biodiversity grounds alone seemed too idealistic, and unlikely to produce widespread support quickly. FOG therefore aims to "sell" the benefits of grassland species in as many contexts as possible - aesthetics, drought tolerance, nutrient use, habitat value, educational and so forth - but with conservation as the ultimate goal, by persuading the community that grasslands have value.

For this reason FOG has targeted many community sectors in its bid for members - including farmers, landscapers, horticulturists, educators, students, town planners and fire managers, as well as ecologists, entomologists, environmentalists, landcare groups and the like.

This approach seems to be paying off, judging by the mix of skills and interests of FOG's members.

It is early days for this new group, but organisers are pleased with the response so far. Three issues of the FOG newsletter have been produced and member activities well patronised. One political party contesting the recent ACT elections announced, after a briefing from FOG, that its platform included creation of grasslands reserves, and



several other candidates are interested in the issue.

The challenge now is to decide where FOG should concentrate its efforts over the coming year. Options include

- lobbying for the creation of grassland reserves, and/or incentives to conserve and restore remnant grasslands on private land
- pushing for creation of a statutory framework which can provide adequate protection for grassland communities
- field work including seed collection, weeding and plant surveys
- publicity and community awareness work
- setting up, or identifying, courses of study which can enable members and non-members to educate themselves about grassland issues, including such topics as species identification, regeneration, and introduction to grasslands ecology
- pushing for the use of grassland species in landscaping, particularly use of local provenance plants in broad-scale public open space projects such as golf courses and parks.

FOG also needs to formalise its goals and structure. Should it limit itself to regional work, or can it play a useful role in the national context? Views from "Danthonia" readers on this point would be

most welcome.

FOG membership is open to anyone interested in lowland native grasslands, whether as an amateur or a professional. A leaflet and membership application form are enclosed with this issue of "Danthonia".

* *Interim Co-ordinator,
Friends of Grasslands*

Contact: Friends of Grasslands, c/- SGAP Canberra, PO Box 217, Civic Square, ACT 2608



Some recent publications of interest

Proceedings of Trends in Sports Turf and Amenity Grassland Management, ed. D E Aldous & T Arthur, Royal Australian Institute of Parks and Recreation, 1994, Price \$25, available from RAIPR, PO Box 333, Mont Albert, Vic 3127. Includes conservation of grassland remnants.

The Management of Threatened Plant Species in National Parks & Wildlife Act Reserves in South Australia, by R J-P Davies, Board of the Botanic Gardens of Adelaide, 1995

The Management of Threatened Plant Species in the Pastoral Zone of South Australia, by R J-P Davies, Pastoral Management Branch, Dept. of Environment and Land Resources, SA

Making Bush Regeneration Work : proceedings of a seminar held at the Institution of Engineers, Sydney, ed. B Diekman, Nature Conservation Council of NSW, 1994

Point of view

Why wattles or willows?

by Paul Dann

The following article was recently published in 'Broadcast', newsletter of Greening Australia (ACT & SE NSW). It is reprinted here in the hope that it will generate some debate in these pages. If you have a comment please write to the Editor of *Danthonia*.

Creek restoration is the objective of an innovative Landcare project in the Braidwood district.

The creek traverses a property which after decades of abuse had become severely eroded as a result of constant overgrazing. The land was eventually smothered by wall-to-wall Scotch broom and blackberry, at times 5m high, and access to the creek was often impossible because of this. The creek itself supports numerous willows, many of which are over age and prone to dangerous collapse.

Earlier investigations have shown that a skilful manipulation of biological control (by goats), slashing, mulching, fire and herbicide, reduces the broom-blackberry to a manageable level. Access to the creek is now possible.

The Landcare project aimed to introduce to the creek native vegetation - treeferns, wattles and other acacias including blackwood, eucalyptus and casuarinas. (Historical records suggest that at the beginning of goldmining in the area, the creek - the bed of which was many metres higher than its present level - was lined with casuarinas which were felled to fuel the gold dredges). This will be done by

fencing to control grazing, spot-spraying, felling willows and using logs to construct 'beaver dams' and planting endemic and other native species.

The project is supervised by a three person team from the Tallaganda Landcare Working Group, an umbrella organisation serving a number of sub-groups in the Upper Shoalhaven catchment.

This is all great stuff for Greening Australia type approaches to revegetation; but a recent inspection by the team raised an interesting question: What's wrong with the creek as it is, in terms of ecological stability?

The creek bed is stable, wherever there are willows, because of the dense root mats. The water flows readily, and supports obvious aquatic biota including eels and other native fish. There is an abundance of terrestrial and avian fauna; and the ecosystem, once the broom and blackberry are suppressed (had it not been for these, incidentally, erosion would have been even more devastating) is not aesthetically displeasing.

So the project manager intends to follow a less-than-purist policy in terms of plant species mix.

While many over-age willows will be lopped and removed, this will not be done instantaneously, for the effect on stream stability would be disastrous. Some willows will be managed for a less competitive effect on planted native (not necessarily endemic) species and to provide 'light-wells' for timber trees such as

blackwoods. Further willow plantings, particularly of a non-invasive nature, are not ruled out, and these might include the commercially valuable cricket bat willow. Deciduous hardwood species such as tulip tree will also be planted, as well as the native food-producing bunya.

The end result will be a diverse, ecologically stable (in an environment altered by Asian and European humans), aesthetically pleasing (at least to those with an open mind) and potentially profitable, riparian ecosystem.

Greening Australia (ACT & NSE NSW) publishes a series of pamphlets called *Greenotes* which will be of interest to *Danthonia* readers. *Greenote* number 16 is 'Willow Watch'. Number 17 is 'Why Grow Natives?' Available from Greening Australia, (ACT & SE NSW), PO Box E216, Queen Victoria Terrace, Canberra, ACT 2600

More significant publications

Centrolepis pedderensis recovery plan, Lynch & Wells, Parks and Wildlife Service, Tasmania, 1994

Prasophyllum concinnum flora recovery plan, management phase, Ziegeler, Parks and Wildlife Service, Tasmania, 1994

Prescription for Extinction: endangered species and patented oriental medicines in trade, A L Gaski & K Johnson, Washington DC, Traffic-USA, 1994

MEMBERS ACTIVITIES

WA CALM'S Recovery Plan for *Banksia cuneata*

A programme for the long term survival of one of Western Australia's rarest banksias is currently being put into practice by members of the local community and the Department of Conservation and Land Management (CALM).

Private landowners are helping to bring the endangered matchstick banksia, *Banksia cuneata*, back from the brink of extinction. Two landholders on whose properties the banksia occurs are members of the recovery team set up to save the species. Populations of the banksia were recently fenced off to protect them from grazing stock.

Description

Banksia cuneata, commonly known as the Matchstick Banksia, is a small tree indigenous to a small area in southern Western Australia. The banksia's striking cream to pink spiky flowers are seen from September to December. Its natural range is from near Popanyinning, a small town 180 kms south-east of Perth to near the township of Quairading approximately 200 kilometres east of Perth. It was originally thought to occur only in the Quairading area where it was first collected in 1937. It was later formally described by botanist Alex George.

More recently, additional populations near Brookton and Popanyinning have been located. Eleven populations

are known to exist at present comprising approximately 500 plants in total. Most of the remaining plants occur on road verges; however some plants are also known from conservation reserves and private remnant bushland.

The plant gets its name from its cuneate or wedge shaped leaves. The inflorescences have an appearance similar to safety matches, hence the common name Matchstick Banksia.



The plant occurs naturally on deep yellow sands and yellow clayey sands, common around the Quairading area, indicating that this species may once have been more widespread. However clearing of the natural vegetation for farmland and other development has limited this plant to these remaining populations.

All populations are a similar age and few young plants occur naturally. The age of each population has been dated back to the early 1960s.

Of concern is that now

adult plants are becoming over mature and are dying at a greater rate than the natural recruitment of young seedlings. Seed is abundant in some populations; it is stored on the adult plant waiting for a mechanism for release. This release mechanism was probably stimulated by fire which naturally would have occurred from time to time, killing the adult plant but allowing for the survival of the population by the release and germination of seed after a fire.

Unfortunately fire is not a viable proposition for regeneration until more research work is carried out, given the vulnerability of these isolated populations to the elements of wind erosion, salination, rabbits, parrots, and weeds which potentially contribute to habitat degradation after a fire. The availability of natural pollinators may also be a limiting factor in the production of viable seed.

The Recovery Plan

A Recovery Plan to study and properly manage this species was written in 1991. The plan has recently been funded for implementation, with funds coming from the Department of Conservation and Land Management (CALM) and the Australian Nature Conservation Agency (ANCA).

The plan has been in operation since January 1994 with the aim of securing the main populations of *B. cuneata*, stimulating the natural increase within the populations, and establishing two new populations in areas likely to have contained the species before clearing.

It is hoped that within two years the six main populations on private property and conservation reserves will be se-

cure and will contain established young plants.

The work to date

The work that has been done already to help achieve this, with the cooperation of local authorities, farmers, volunteers and other interested people includes:

- The change of purpose of two existing reserves containing *Banksia cuneata* to Nature Reserves. This will ensure that the reserves can be managed for conservation, thus protecting these populations of Matchstick Banksia.

- Rabbit netting has been placed around the main populations and eradication of rabbits from within populations has taken place.

- Each population has been surveyed and individual plants counted. This will allow for the production of base maps for the future monitoring of population numbers on an annual basis.

- Seed has been collected for long term storage and germination trials at the Narrogin CALM nursery and Men of Trees nursery.

- Methods are currently being investigated for the re-establishment of seedlings into natural habitats, which will help to maintain the viability of the naturally occurring populations into the future.

Some problems

As with the management of most of Australia's threatened species, the task is never easy, and problems are always encountered. It is hoped that through this plan some of the problems associated with the long term protection of the Matchstick Banksia can be overcome. Some of the problems encountered to date

include:

- The underground water problem that generally goes unnoticed may have serious long term effects on the condition of at least three of the natural populations. Monitoring needs to be implemented to assess the ground water situation.

- Seedling establishment within populations will require considerable effort to ensure successful establishment



Figure 1. Distribution of *B. cuneata*

of seedlings by artificial and natural regeneration. A wide range of different techniques needs to be studied.

- Rabbit control will be ongoing as the Matchstick Banksia grows on sites that rabbits love.

- The populations occurring on narrow strips of uncleared road reserve require intensive management to prevent damage from natural and unnatural elements.

Phytophthora cinnamomi (Dieback fungus) has been located in one population. All the plants have been sprayed with *Phosphonate*, a chemical designed to increase the plants natural immunity to fungal attack. This population will re-

quire follow-up spraying every two years.

Over the next two years it is hoped that at least some of these problems can be overcome or managed to prevent the further decline of plant numbers in each population. It is hoped that seedlings can be successfully established within the natural populations and the people of the local communities will maintain an interest in ensuring the safe keeping of our natural heritage and the survival of this plant for future generations.

The enthusiasm of local landholders in the project is one of the highlights of the recovery plan.

Judy Williams of Brookton, has been contracted by CALM to carry out a census of the banksia and to map known populations of the plant.

Greg Durrell is CALM's operations officer for the *B. cuneata* recovery project. Greg may be contacted at CALM Narrogin District Headquarters, PO Box 100, Narrogin, WA 6312

Rising from the ashes

David Keith, Research Scientist,
NSW National Parks and Wildlife
Service

In January 1994 some of the most extensive bushfires in years burned through parts of the coast and tablelands in central and northern New South Wales. As images of devastation were cast relentlessly onto our television screens and the pages of the print media, it was easy to think that things could never be the same again.

In the months since those fires, the charred landscapes have begun to green again and it seems incredible that our native plants and animals could be so resilient. But perhaps these views of devastation and resilience are equally naive. Beyond the superficial return to green, are there more subtle changes to populations of plants and animals that ultimately mean that some of the diversity in our unique bushland will be lost?

Ecologists have been carrying out scientific research to understand how native plants and animals cope with fires, but we still have a long way to go. A recent bibliography of fire ecology in Australia * lists over 2000 reports detailing the effects of fire on plants and animals, but these deal with only a few of the thousands of species that live in fire-prone habitats. Some aspects of fire ecology are still poorly understood. Nonetheless, there is sufficient knowledge to point to some important principles for conservation.

Reproduction through fire

Many Australian species of

plants depend on fire for reproduction. Plants such as grass trees (*Xanthorrhoea*), Christmas bells (*Blandfordia*) and many native lilies and grass-like plants flower and produce seed most prolifically in the first couple of seasons after a fire. Other species, like some of the leek orchids (*Prasophyllum*), are even more specialised. They only emerge above ground and flower in the year after a fire. After their seed is mature they die off and lie dormant in the soil as bulbs until the next fire. In the winter and spring of 1994, a spectacular floral display emerged from the same landscapes depicted as 'moonscapes' only a few months before.

The effect of fire on native legumes, including wattles, is well known. The seeds of these plants lie dormant in the soil until heat from a fire cracks their hard seed coat, allowing them to absorb water and germinate. Recent research on other species suggests that other fire-related germination cues may include the chemicals released in smoke and charred wood. Another group of plants that includes banksia, hakea, sheoaks (*Casuarina*) and native cypress pines (*Callitris*), retain most of their seeds in woody fruits held on their branches. The fruits insulate the sensitive seeds from heat and release the seeds soon after fire, allowing them to germinate on the rich ash bed. The flush of new seedlings can be seen in almost any recently burnt area.

Animal survival

Much public concern centres on the survival of animals during and after a fire. While less is known about animals than plants, a surprising num-

ber of animals survive fire, either by evading the flames or by taking refuge in safe sites such as burrows or crevices. The availability of food and shelter in the post-fire months may claim more lives than the fire, particularly through starving or predation. Some animals cope by adjusting their diet and behaviour. Recent research in Royal National Park suggests that *Antechinus*, a small ground-dwelling mammal, survived the January fires by sheltering in rock crevices. Their numbers decline in the first winter after fire, apparently in response to food shortage, but in Royal National Park the numbers have not declined and *Antechinus* fed on the pollen of grass trees which flowered profusely a few months after the fire.

Plant responses to fires

There is a tremendous variety in the ways these species respond to a fire. The most important changes in the bush come, not as a result of a single fire, but in response to sequences of fires or 'fire regimes'. Fire regime is a term that describes the frequency, intensity, season and spatial extent of a series of fires.

Fire frequency

Fire frequency is the most critical aspect of fire regimes for plants and animals. High frequency fire leads to the decline of populations of many woody plant species because fires repeatedly interrupt critical processes such as fruit production and growth that maintain the capacity of the population to persist and regenerate. For those plant species in which all plants are killed by fire (ie non resprouters), the decline may be rapid because post-fire regeneration depends

entirely on the level of pre-fire seed reserves. If there is insufficient time between fires to allow seed reserves to build up, these plants will decline in numbers or possibly be eliminated altogether. In many species, seed production may not begin until many years after fire. Resprouters are often thought to be hardier than non-resprouters. But some resprouters are also susceptible to frequent fire because their young seedlings grow slowly and are too small to tolerate a fire if it comes too soon. Unless some new seedlings survive to replace bigger plants lost to old age, disease or other causes, woody resprouters will eventually disappear under the onslaught of frequent fire.

The loss of woody shrubs under frequent fire can have an indirect effect on other parts of the ecosystem. This is particularly so for animals that depend on the cover provided by certain woody plant species for shelter and those that depend on nectar, seeds or leaves of particular species for food at certain times of the year. Frequent fire also reduces the availability of leaf litter and fallen wood utilised by a range of small vertebrate and invertebrate animals.

Fire-wise

The January 1994 bushfires have been most destructive to wildlife where they contributed to a sequence of frequent fire. Large areas of Royal and Bundjalung National Parks have been burnt twice in only five and three years respectively. The warning signs are there: massive declines in the populations of some plant species have been recorded in the course of our ongoing

research. But we know enough to be confident that their numbers will bounce back, so long as those areas receive respite from a major fire for at least a decade. While that says a lot for the resilience of Australian fire-prone ecosystems, it also highlights the need for our vigilance to ensure that fire is used wisely in the bush.

* *Bibliography of Fire Ecology in Australia*, 4th edition, by M Gill, P Moore & WK Martin, NSW NPWS, 1994

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Conference on Local Environmental Action, Melbourne, Contact Context Pty Ltd, ph 03-380 6933, fax 03-380 4066, e-mail: context@peg.apc.org

May 20, 1995

ANPC ACT/SE NSW Region, meeting at *Bungendore*, 2-5 pm

September 14-16, 1995

Taking a Broader View, Conference of the Society for Ecological Restoration, USA. Contact SER Conference, c/o Engineering Professional Programs, 3201 Fremont Avenue N, Seattle, WA 98103, USA

September 25-29, 1995, Reaching Out-Botanic Gardens and Conservation into the 21st Century, BGCI- 4th International Botanic Gardens Conservation Congress, Perth, WA, Contact: Dr Kingsley Dixon, Kings Park, 09-321 5065, fax 09-322 5064.

September 27 1995, 2nd ANPC National Conference, Perth, WA. Contact: ANPC, 06-2509509

December 8 1995, The Literature of Australian Natural History, a seminar about writers and writing on the animals and plants of Australia, Canberra, enquiries; Nick Drayson, (06) 268 8433, fax (06) 268 8899

continued from page 11 - Biodiversity and Fire

"Code of Practice for Fire Management" and it is essential that provision be made in such policies to incorporate, at an appropriate level of priority, criteria relating to maintenance of biodiversity and sound ecological management.

Diary

May 6, 1995

ANPC WA Regional Meeting, Perth, contact Anne Cochrane, ph 09-334 0502, fax 09 334 0515

May 6, 1995

ANPC Subtropical Region, McDowall, Qld, contact Peter Armstrong 07-353 3707, fax 07-353 2818

May 9-10, 1995

After Dieback, at Orange, NSW, Greening Australia, Contact Dick Green, GA NSW, PO Box 350, Wagga Wagga, NSW 2650, ph 069-218 202, fax 069-217 434

May 10-12, 1995

Localinks, The National

Wet Tropics Flora display at Cairns

Garry Werren & David Warmington

The Wet Tropics Management Authority has provided funding for the establishment of a Wet Tropics Flora Display in the Flecker Botanical Gardens in Cairns. The display will explore the evolution of the plant kingdom and the development of the contemporary flora and vegetation of the wet tropics region. Exhibits of rare and/or threatened plant species will form an integral component. This project will contribute substantially to presentational obligations entered into under the World Heritage Convention.

The display, to be established on the eastern flank of the existing Gardens, will provide visitors with a wholesome experience of a range of wet tropics plants. It will attempt to develop a comprehensive understanding of the development of land plants and of the special evolutionary significance of this region. In addition, whilst partly contributing to ex situ plant conservation of plants of special conservation concern, it will serve to develop an appreciation of those plants which are either geographically restricted and/or threatened with extinction.

The display design relies on sequenced grouped plantings of wet tropics species representative of major evolutionary development within the plant kingdom. Those plantings will feature the cryptogams/fork 'ferns'/lycophods, the ferns, the cycads, conifers and flowering plants

arranged along a walkway in the sequence devised to be analogous to the development of the land floras. These exhibits would then be complimented by specimen plantings of wet tropics taxa of special conservation interest, including examples of a variety of life forms which, by virtue of their relictual evolutionary status, low viability or because of the operation of human-induced threatening processes, have become rare and/or vulnerable to extinction. This will form a display of a type not known from similar establishments about the country. It will be distinctively regional and will provide an enormously useful complement to other information detailing and promoting the botanical significance of the wet tropics. A major focus will be on the Gondwanan inheritance and the outstanding universal value of this region as a reservoir of 'primitive' angiosperms and other relictual taxa.

Examples drawn from the 483 species regarded as rare or threatened within the wet tropics region will also be featured in plantings grouped according to conservation status. Appropriately explicit and scientifically accurate signage will be erected throughout.

The responsibility for implementing the display will lie with the Cairns City Council, specifically the staff of the Flecker Botanical Gardens under the supervision by the Curator, David Warmington. Scientific advice on information to be presented and in any changes of nomenclature will be taken from the CSIRO Tropical Forest Research Centre and the Queensland

Herbarium.

For more information contact David Warmington, Curator, Flecker Botanic Gardens, PO Box 359, Cairns, Qld 4870, telephone (070)50 2482, fax (070)32 1183

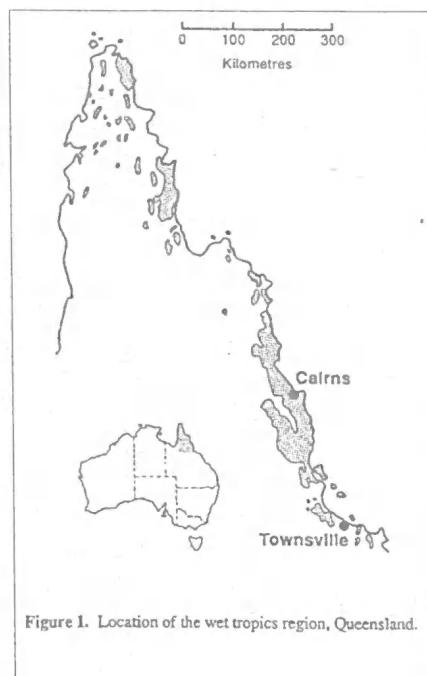


Figure 1. Location of the wet tropics region, Queensland.

New brochures from ANCA

Two new brochures on nature conservation issues have recently been produced by the Australian Nature Conservation Agency.

Environmental weeds in Australia defines an environmental weed, gives several examples of weeds that are seriously affecting natural areas and indicates what can be done about the problems.

Australian grasslands describes Australia's most threatened natural communities, threats and conservation issues.

These attractive publications are available from The Australian Nature Conservation Agency, PO Box 636, Canberra, ACT 2601

Biodiversity and Fire: The Effects and Effectiveness of Fire Management.

A conference organised by the Victorian National Parks Association, held at the Victorian University of Technology, Footscray, Victoria, 8-9 October, 1994.

By Max Bartley, Catherine Caddle¹ and Dale Tonkinson¹.

(¹Greening Australia,
Melbourne.)

Community attitudes and responses to fire during most of European settlement in Australia have emphasised fire prevention and hazard reduction. Only a small proportion of fire management prescriptions have been written using ecological criteria, yet large tracts (and often important remnants) of natural ecosystems on public land are prescription-burnt regularly. Our approach to fire management is in need of re-focussing to achieve both goals of fire protection and sound ecological management. Exchange of information between researchers and land managers, and critical evaluation of management procedures are vital components in that process of integration.

The conference provided a forum for a broad range of expertise and covered topics including fuel types and fire behaviour; effects of fire (frequent low-intensity burning in particular) on flora, fauna and soils; assessment of fire protection needs and effectiveness; and the integration of fire protection and biodiversity management. Results from a considerable body of research were presented and

readers seeking detail should consult the conference proceedings, to be published by V.N.P.A.

Information is lacking

Controversy surrounding the use of fire in land management has mostly stemmed from concern about the impacts of inappropriate frequency, intensity and season of burning on biodiversity. Despite the bulk of anecdotal and historical information, not enough is known about fire regimes in most areas before white settlement to attempt to recreate them. Therefore, ecological prescriptions must be based on accumulated knowledge about the biota and their interaction with fire, with the object of conserving at least regional biodiversity.

Biodiversity needs to be assessed carefully. In many plant communities, for example, dormant propagules mask a sometimes substantial quotient of species richness which may be hidden before, but apparent after fire. Apparent richness is not an appropriate single index of diversity in this context and may even mask the loss of some of the biota.

Frequent-burn studies

A related aspect was demonstrated for invertebrate diversity also. Data were presented from frequent burning studies which assessed ant species occurrence in dry sclerophyll forest on the mid-north coast of New South Wales (3-4 years prescribed burning frequency; estimated 5-15 years natural cycle). These showed that although richness fell gradually with time since fire, habitat differentiation was greater in older stands, in which dietary- and habitat-specialists became evident. Such species were considered likely to be lost locally with frequent fire because of habitat simplification,

and possibly from the regional fauna if fuel reduction burning covered a large enough area without leaving adequate refuges.

Areas which have been repeatedly burnt for many years, at higher than appropriate frequency, present difficulties for biodiversity studies. It is instructive to look at remnant old-growth and refuge areas to evaluate specialised habitats which may have been removed by frequent fire.

Paradox

At the other end of the spectrum, communities such as grasslands and grassy woodlands which require more frequent fire than is currently applied, test the response of management authorities to prescribe fire to sustain biodiversity. A mechanism is needed to inject such priorities into the planning system for public land, including biological reserves.

Artefacts of experimental design or sampling introduce another suite of problems. Inadequately replicated comparisons, tenuous assumptions of pre-fire site similarity or poor controls all inhibit strong conclusions. Changes in species-area relationships can also impair permanent-plot studies. High trapping rates of surface-active vertebrates or invertebrates may be an artefact of post-fire reduction in litter, rather than an increase in resident animals, and proportions of taxa may also appear to change.

Many valuable data have been collected by observation and opportunistic monitoring; such work should continue, but it is also imperative that specifically designed, long-term, securely funded projects

be encouraged. Current knowledge about ecological interactions and long-term effects of frequent fire is still very limited and much more research is needed, covering a wider range of habitats, so as to provide information to managers, with as little extrapolation as possible.

Fire regime variety

In lieu of such detailed data, a "hands-off" approach is not an option for most areas, especially those on rural or urban fringes. We are forced to act on fire issues while lacking the knowledge to predict long-term outcomes. An interim strategy for land managers should be to apply a diverse range of fire regimes (including fire exclusion) to maximise habitat diversity and minimise the risk of reducing overall biodiversity. Clearly, this range should not include regimes known to be detrimental over the majority of an area, although some "pushing" of ecological limits to acquire new response data could be included. Sufficient resources must be made available for continued monitoring of such actions. Provision should also be made in long-term plans for wildfire, fuel reduction burning, weed control and other factors such as drought. Land managers need to remain flexible over time in decision making and policy amendment.

Management prescriptions based on the requirements of one or a few species - for example, "indicator" species for disturbance or a particular successional stage - must be used cautiously and with monitoring of effects on the remaining biota. Management for a threatened species popu-

lation must also take into account the long-term viability of the habitat.

Predictive modelling

Predictive modelling will become an important tool to support decision-making as more reliable data are generated and understanding of fire ecology increases. Sophisticated models may be used to predict such quantities as mean times to local extinction, return times for naturally-occurring fires, optimising costs of management options, maximised survival chances of populations and appropriate patch size for burning. Solutions to management questions are unlikely to be singular. Multiple or optimised solutions, perhaps with a stochastic component to maintain diversity, are more realistic.

Understanding fire behaviour is fundamental to the prediction of fire occurrence, spread and ecological impact. Sophisticated fuel assessment must consider not only quantity, but spatial arrangement of fuel and season of fire. For example, in a central Victorian dry sclerophyll forest, fuel weights suggested recovery to pre-fire loads after only 2-4 years, but evaluation of fuel structure indicated that more than 10 years elapsed before the important bark and shrub fuels recovered. Autumn fires effected a longer period of fuel reduction than spring fires, probably because there was less disruption to decomposer organisms. Substantial differences in species presence, fuel characteristics and fire behaviour in different vegetation types mean that a great deal more research is needed to amass data for predictive modelling.

Fuel reduction burning clearly provides a substantial short-term decrease in the risk of uncontrollable wildfire, but our ability to control fire is rapidly exceeded in extreme fire weather. Under such conditions, suppression across large areas of vegetation may simply be impossible with current technology, and so reversion to strategic protection of life and property must be accepted. The Country Fire Authority in Victoria is aiming at a more strategic allocation of resources to brigades, determined with the aid of a GIS-based threat model, using available information about site-specific fire threat and potential asset damage.

"Community Fireguard"

In order for ecologically sustainable fire management to be a viable practice in settled areas, both government and community involvement must improve. Education to raise awareness of fire protection and survival techniques for vulnerable communities is the aim of "Community Fireguard" - a newly developed programme in use by the Victorian Country Fire Authority, together with involvement in roadside management and fire planning in local conservation reserves. Such involvement should aim to decrease the requirement for over-frequent fuel reduction burning in ecologically sensitive areas.

Cut-backs in government funding have already forced many experienced personnel out of departments with land management responsibilities and so resources are severely diminished. The Victorian DCNR is developing a new

⇒ *Continued at foot of page 8*

Sub-tropical region

Report by Karin Hall

The second meeting of the ANPC Subtropical Region was facilitated by Bruce Tinworth and held at the Horticulture Complex, Ipswich Institute of TAFE, Bundamba Campus. Sixteen people were present, with apologies from intending Northern NSW participants who were floodbound!

In business arising from the previous meeting Bruce Tinworth, Vice Chairperson, Ipswich SGAP, spoke on Queensland's draft plant protection legislation 'Conservation Plan for the Management of Protected Plants in Trade'. It aims to ensure biological diversity and is concerned with the seed collection of native plants in the future, particularly those that are rare or threatened and/or in high horticultural demand.

Craig Maudsley, Environmental Officer of Moreton Shire Council, discussed various environmental issues including Council's policies concerning roadside vegetation and environmental weeds. The Shire covers 1800 sq. km. and therefore takes a broad approach to environmental issues. A flora and fauna database has recently been compiled and the public will be able to access the information. Specific locations for rare or threatened species, however, will not be available. The Council now has a community works officer, Katherine Hiss, to liaise with the various community groups. Moreton Shire's Environmental Weed Policy (December 1994) is an internal document which covers nasties to be gradually

eradicated from Council owned land. The policy does not cover private land. The environmental weed species are shown in the table below:

Trees

- Celtis sinensis* (Chinese elm, Chinese celtis)
- Cinnamomum camphora* (Camphor laurel)
- Schinus terebinthifolia* (Broad leafed pepper tree)
- Arecastrum romanzoffianum* (Queen palm, Cocos palm)
- Schefflera actinophylla* (Umbrella tree)
- Eucalyptus torelliana* (Cadaghi)
- Opuntia stricta* (Prickly pear)

Shrubs

- Cortaderia selloana* (Pampas grass)
- Lantana camara* (Lantana bush)
- Gomphocarpus physocarpus, G. fruticosus* (balloon cotton bushes)
- Bryophyllum spp.* (Mother of millions)

Climbers and ground covers

- Caesalpinia decapetala* (Wait-a-while)
- Solanum seaforthianum* (Nightshade)
- Macfadyena unguis-cati* (Cat's claw creeper)
- Anredera cordifolia* (Madeira vine)
- Cardiospermum grandiflorum* (Balloon vine)
- Protasparagus africanus* (Asparagus fern)
- P. plumosus* (Climbing asparagus)
- Tradescantia albiflora* (Wandering jew)
- Wedelia trilobata* (Singapore daisy)

dependent on the natural regrowth of native vegetation if a soil seed store is present or by plantings if it is not.

Craig also discussed roadside vegetation and how its significance is now formally recognised. An exhaustive inventory of plant species is now

The Council is now undertaking various strategies to eradicate these weed species. For example, Chinese elm is usually cut down when its seeds are not ripe and the stumps injected with herbicide. Fire is sometimes used for seedling regrowth. If a riparian canopy needs to be kept intact for wildlife and aesthetic reasons only every third tree is initially removed and the next year every second tree

being recorded after which a roadside management policy will be drawn up and implemented. Aerial photographs of the Shire reveal that 98% of the Bremer Basin has been cleared. These roadside remnants are therefore a significant part of the 2% of natural vegetation that remains. Information from this study could also be used in future courses involving road operator training where operators can be trained to

recognise rare or threatened species.

Jervase Pender, Environmental Officer of Ipswich City Council, spoke on the amalgamation of the Ipswich and Moreton Councils. He described how the new Council can draw country ideas from Moreton and city ideas from Ipswich and therefore have the best of both worlds. Ipswich has an ongoing Community Greening Program involving tree planting on public crown land. It supplies trees and planting material from its Queens Park Nursery to various community groups and thereby hopes to create community pride whilst beautifying local parkland.

Other projects which Ipswich is involved in include the use of Blackstone Hall as a Bushland Centre, the Bundamba Sewerage Tree farm, the Environmental Advisory Committee and the Garden and Bushland Competition.

Alison Shapcott, a population geneticist from the Botany Department of the University of Queensland, then spoke on the appropriate methods of seed collecting for revegetation purposes in order to maintain biodiversity. No species is identical genetically and different populations can vary greatly. Morphological differences sometimes reflect environmental as well as genetic differences. Where possible seed should be gathered from local seed sources and not brought in from other areas as this can be detrimental to existing local populations. However seed should not be collected from one plant only within a population as this can in the future lead to inbreeding and result in slow growth and poor

reproductive output in future generations. Collecting seed from several plants will help to prevent this occurring. Species that normally come from big populations and that are now in small populations are more affected by inbreeding than those that have always had a small distribution.

When revegetating an area record keeping of what trees have been planted and where they have come from will be an invaluable guide to future follow-up planting. Data base collection kits for this purpose are available from Geoff Borschmann, Project Officer, Greening Australia. They contain instructions on seed collecting and various items such as labels and collection bags.

Bob Grehan, Administrator, Horticulture Department, Ipswich Institute of TAFE, then discussed the role of his Department as an educational provider training people for industry and councils in areas such as nursery, parks and gardens, turfcare and landscaping. The Department was also involved in bush regeneration projects with several LEAP (Landcare Environment Action Program) groups. It had the opportunity to offer an alternative approach to plant selection by propagating local plant species, particularly those that are rare or threatened. Students will then have the opportunity to learn to identify and conserve these species and not drive over them with a bulldozer or mower through lack of knowledge. Propagated plants could also be used in the College grounds and in long-term projects such as Boyce's Quarry. The area could become a source of plant material in the future

The SGAP/TAFE Rare and Threatened Species Botanic Gardens in the College grounds was visited followed by a visit to Bob Gamble Park along the Bremer River which is part of Ipswich City Council's Greening program.

A good time was had by all and it was a unique opportunity for such a broad section of the community to get together to discuss plant conservation.

ANPC Subtropical region

Next Meeting

Saturday 6 May 1995

at 1.00 pm

at

Downfall Creek Bushland Centre, 815 Rode Road.

McDowall

(free electric BBQ available, 4 minutes to fast food outlets)

For more information contact Peter Armstrong (07) 3533707 or fax (07) 3532818

ANPC Victorian region

ANPC members based in Victoria are advised to contact

Adrian Moorees
ph (03) 4508696 (w)
fax (03) 450 8799

for details about forthcoming meetings in Victoria

SE NSW/ACT region

Report by Mark Richardson

The first meeting of the SE NSW/ACT regional group was held on Saturday 25 February at the Centre for Resource and Environmental Studies (CRES), Australian National University.

The meeting commenced with a brief introduction to ANPC for those participants that were not members. Jeanette Mill (National Office, ANPC) then spoke about the development of regional groups in Australia to date and some future possible groups. The possible extent of the SE NSW/ACT region was discussed. It was agreed that the core area would be from the NSW south coast to Illawarra and as far west as the western slopes of NSW but this may be extended to cater for individual projects.

John Briggs (Centre for Plant Biodiversity Research) spoke about the rare or threatened plant taxa in the region. A summary of the numbers in the various conservation categories was supplied. Maps had been prepared in conjunction with CRES to show the actual distribution of species in the area. By accessing information from the Melbourne and Sydney herbaria, the maps will be further developed.

From John's talk it was obvious that there is a considerable need for surveying and a need to record the *absence* as well as *presence* of a species in an area. The opportunity for ANPC members to be involved in this monitoring was discussed.

Roger Good (NSW National Parks and Wildlife Service,

Southern Region) talked about a vegetation survey being done as part of a biodiversity and remnant vegetation audit. Roger identified the western slopes as an area of great concern in relation to the conservation of remnant vegetation. He also discussed other vegetation networks which already include a variety of people working on specific associations (eg. Callitris-Box Network). The possibility of the ANPC developing a proforma for the assessment of remnant vegetation was discussed; however, it was agreed that this is already being done by numerous other groups. The ANPC could play a useful role by collating the work that has already been done. Roger reported on the range of maps that can be produced from the information held by the NSW NPWS. A list of topics which can be combined to produce maps will be available in the future.

Reports were then given by several other members. John Knight (Eurobodalla Native Botanic Gardens) talked about the Gardens and its charter to grow only native plants of the NSW south coast area. He also invited members to accompany ENBG staff and Friends on future collecting trips. Stephen Popple from the Wollongong Botanic Garden spoke about the work of the Gardens and some of the local reserves that the Gardens manages. He noted that Wollongong is soon to be the first municipality in Australia to run out of land for development. Jo Walker (SGAP Canberra Region) told the meeting about some of the conservation work in which members are involved. This includes a recovery plan for

Grevillea wilkinsonii (Tumut), survey work at a local reserve and the establishment of the Friends of Grasslands (see lead article, this edition). Jill Landsberg spoke briefly about a newly established ACT Flora and Fauna Committee, and Katrina Jensz about the Endangered Species Advisory Committee's recent paper on the conservation of threatened communities.

There was then a general discussion in which the future organisation of the group and possible topics were considered. It was agreed that the next topic will be "Tapping into Community Support for Threatened Species Conservation". It is to be held in May at Bungendore and an organising committee was formed. The committee will also put together a questionnaire to obtain information about members' activities and available literature including local surveys, reports and published papers relevant to plant conservation in our area. It was agreed that future meetings will have varying formats and include presentations and field trips. Bob Makinson summed the meeting up and this was followed by a most pleasant and relaxed barbecue organised by the meeting's hosts at CRES.

ANPC ACT/SE NSW region

Next Meeting

May 20 1995, 2-5 pm
at Bungendore Community Centre

followed by light refreshments.
There may also be a short excursion to Brooks Hill. (Members will be notified by mail)

Western Australia region

Report by Jeanette Mill

On February 20 a gathering of 30 of ANPC's members in WA (and one member from Sydney!) was held at Kings Park Lecture Theatre. As was the pattern for similar meetings held in other regions over recent months, the purpose was to discuss the need for meetings in the region, and to decide on the logistics if such meetings were to be held in the future.

Those in attendance briefly introduced themselves and then Jeanette Mill gave a summary of the development of regional groups to date.

Discussion ensued on the role of an ANPC regional group, including the observation that the measure of the value of such a group will be if it improves on the ground conservation. Concern was expressed about the possible duplication caused by having another organisation interested in plant conservation holding meetings in the region. It was agreed that the ANPC could play a role in information sharing between the many and varied organisations working in plant conservation in the region. A meeting/seminar every two to three months was seen as desirable. Kings Park was offered as a venue at no charge.

Several topics were suggested for future meetings, including information sessions on the work of Kings Park and Botanic Garden (KPBG), Conservation and Land Management (CALM), and a session on seed collection and storage. Anne Cochrane of the CALM Threatened Flora Seed Centre

(see *Danthonia* Vol 3 No 3) volunteered to run a session on the latter topic with assistance from a small organising committee. Details of the next meeting are outlined below.

Western Australia Region

Next Meeting

Saturday 6th May
2-5pm

Followed by light refreshments.

Program:

- Conservation versus preservation
- Seed collection: genetic resource conservation of rare plants
- Seed storage - KPG; Anne Cochrane, CALM Threatened Flora Seed Store - Large scale collections
- Demonstrations of equipment & techniques
- Permits and protocols.

Invitations to the meeting with venue and other details will be sent to all members in the region.

For further information contact Anne Cochrane Ph: 09 334 0502, Fax: 09 334 0515

South Australian Region

The Threatened Plant Action Group (TPAG) has been established by the National Threatened Species Network (NTSN) in South Australia. Organisations interested in plant conservation have joined forces in this group, conducting, among other things, field trips, working bees to rehabilitate habitat for threatened plant species, information days and seminars. Group members meet regularly to plan and co-ordinate these activities.

Mark Richardson and Jeanette Mill attended a TPAG meeting on 22nd February. A three-day seminar is planned for later in 1995, providing scope for involvement of ANPC members in the region. The NTSN-SA was in the process of appointing a new co-ordinator at the time of the meeting, so further liaison between the groups will occur when the new coordinator is on board. ANPC members will be kept informed of progress. However, if further information about the TPAG's activities in SA is required, contact the Network Coordinator, National Threatened Species Network-SA, 120 Wakefield St, Adelaide, SA 5000. Ph: 08 223 5155 Fax: 08 232 4782.



THE AUSTRALIAN NETWORK FOR PLANT CONSERVATION MEMBERSHIP LIST

The date (1994/5) indicates that the member has joined or renewed for that year. Addresses and names of contact persons are available from the National Office.

Corporate Members

ACT Parks & Conservation Service, (1995)

Australian Forestry Council

Australian Mining Industry Council

Australian Tree Seed Centre, CSIRO, (1994)

Botanic Gardens of Adelaide, SA (1995)

Adelaide Zoo, SA (1995)

Albury Botanic Gardens, NSW (1994)

Alcoa of Australia Ltd.; WA (1994)

Australian National Botanic Gardens (1995)

Aust. Nature Conservation Agency (1994)

Barcaldine Shire Council (1994)

Brisbane Botanical Gardens (1995)

CSIRO, Division of Plant Industry (1994)

Coffs Harbour City Council; NSW (1995)

Conservation & Land Management, WA (1995)

Conservation Commission of the NT (1994)

Eurobodalla Botanic Garden, NSW (1995)

Flecker Botanic Gardens; Qld (1995)

City of Frankston, Vic, (1995)

Forestry Tasmania (1995)

George Caley Botanic Garden; NSW, (1994)

Gladstone Tondonia Botanic Gardens; Qld (1995)

Kings Park and Botanic Gardens; WA (1995)

Kuringai Municipal Council, NSW (1994)

NSW-NPWS, Northern Region (1995)

Norfolk Island Botanic Garden (1994)

North Forest Products; Tas (1995)

Pacific Grid, NSW (1995)

Pacific Power, NSW (1995)

Parks Wildlife and Heritage, Tas (1995)

Queensland Herbarium (1995)

Randwick City Council NSW (1994)

Royal Botanic Gardens, Melbourne, Vic (1995)

Royal Botanic Gardens, Sydney; NSW, (1995)

Royal Tasmanian Botanical Gardens (1994)

Townsville Botanic Gardens; Qld (1994)

Wollongong Botanic Gardens (1995)

Zoological Parks Board of New South Wales (1995)

Zoological Board of Victoria (1994)

International Associates

Botanic Gardens Conservation Intl, UK

Center for Plant Conservation, USA

Honiora Botanic Gardens, Solomon Islands

Kebun Raya Indonesia

Missouri Botanical Gardens Library

National Botanical Institute, South Africa

Rare Plant Consortium, USA

Society for Ecological Restoration, USA

Suva Botanical Gardens, Fiji

Vailima Botanic Gardens, Western Samoa

Other Organisations

Arid Land Botanic Garden, SA, (1995)

Assn. of Soc. for Growing Aust Plants (1995)

Australian Assn. of Bush Regenerators (1994)

Aust. Trust for Conservation Volunteers (1994)

Brunswick Valley Heritage Park, NSW (1995)

Burrendong Arboretum Trust; NSW (1994)

Deakin University, Rusden Campus Library, Vic (1994)

Earth Repair Foundation (1994)

Friends of North Coast Regional BG; NSW(1995)

Friends of the Points; Vic (1994)

Greening Australia (ACT) (1994)

Greening Australia (NSW) (1995)

Greening Australia (Vic), (1995)

Greening Western Australia (1994)

Hunter Region Botanic Gardens; NSW (1995)

Illawarra Zoological Society, NSW (1994)
Joseph Banks Native Plants Res, NSW (1994)
Merungle Hill Landcare, NSW (1994)
Missouri Botanical Gardens (1995)
Myall Park Botanic Garden, Qld (1995)
National Threatened Species Network (1995)
Olive Pink Flora Reserve; NT (1995)
Pangarinda Arboretum, SA (1994)
Rainforest Seed Collective, (1995)
Royal Geographical Society of Qld (1995)
SGAP Blue Mtns Group, (1995)
SGAP - Canberra Region Inc (1994)
SGAP - Dryandra Study Group (1994)
SGAP - East Hills Group, (1995)
SGAP - Grampians Group; Vic (1994)
SGAP - Ipswich Branch (1994)
SGAP - Maroondah Inc (1995)
SGAP - New South Wales Ltd.(1995)
SGAP - Newcastle; NSW (1995)
SGAP - North Shore; NSW (1995)
SGAP - North West; Tas (1995)
SGAP - Queensland Region (1994)
SGAP - South West Slopes; NSW, (1994)
SGAP Southside,Qld (1995)
SGAP - Tasmania Region (1994)
Stony Range Flora Reserve, NSW (1995)
Sunraysia Oasis Botanic Gardens (1994)
Tasmanian Arboretum Inc (1995)
Threatened Species Network (NT) (1994)
Threatened Species Network (QLD) (1994)
Threatened Species Network (SA) (1994)
Wildflower Society of Western Australia (1995)
Wildflower Soc. of WA - Mandurah (1995)
World Wide Fund for Nature Australia,(1994)

Individual Members

Ian Anderson, ACT (1995)

Dr David Aldous, Vic (1995)

Peter Barner, ACT (1995)

Dr Robert Boden, ACT (1995)

Dr Barbara Briggs, NSW (1995)

Dr AHD Brown, ACT (1995)

Douglas Brown (1995)

Kate Brown (1994)

S Brunskill, Vic (1994)

Dulcie Buddee, NSW (1995)

P Bundock, NSW (1994)

R Burns; Tas (1994)

Dr G Burrows, NSW (1994)

Geoff Butler NSW (1995)

Irene Champion, Qld (1995)

John Clark, ACT (1994)

Anne Coates; WA (1994)

Anne Cochrane, WA (1995)

N & J Cowie, NSW (1995)

I Crawford, ACT (1994)

S Cropper, Vic (1994)

John Delpratt (1994)

Susan Denham, NSW (1995)

Stuart Donaldson; ACT (1994)

Alison Elvin, ACT (1995)

Elizabeth Fenton, Vic (1994)

Paul Field, NSW,(1995)

Paul Foreman (1995)

Julie Foster, ACT (1995)

Elizabeth George; WA (1995)

L Gilfedder; Tas (1994)

Roger Good, NSW (1994)

Dr Janet Gorst; Tas (1995)

Robert Gourley, ACT (1994)

Joanne Green, NSW (1995)

Helen Grey-Smith, NSW (1995)

Sandra Griffith, Qld,(1995)

Barrie Hadlow; ACT (1995)

Roger Hart, Christmas Is. (1995)
Joy Haviland, NSW (1994)

Jill Hickie, Tas (1995)

Timothy Ingles, ACT (1994)

Gregory Jackson, ACT (1994)

Kelly Jones, Vic (1994)

Alison Kelly, NSW (1994)

Kingfern Natives; NSW (1995)

H Knowls, Qld, (1995)

Jill Landsberg, ACT (1995)

Limpinwood Gardens Nursery, NSW (1994)

John Litchfield, ACT (1995)

Vicki Long WA (1995)

Bill McDonald; Qld (1995)

Alex Mackenzie NSW (1995)

Bob Makinson ACT (1994)

David Mason; NSW (1995)

Maria Matthes, NSW (1994)

Stephen Mattingley, ACT (1994)

Jennifer Meyer, TAS (1994)

Geoffrey Mitchell, NSW (1995)

Judith Moffatt, Qld (1994)

Brian Mole, Vic (1994)

Adrian Moorrees, Vic, (1994)

Sharon Nash, NSW, (1994)

Robyn Newman, NSW, (1995)

Alexander Nicol, NSW (1995)

Nan Nicholson, NSW (1995)

Malcolm Noble, NSW (1994)

Ivana Noell, Qld, (1995)

Joan Overeem, NSW (1994)

Matthew Oxford, SA (1995)

Dr. Bob Parsons; Vic (1995)

Joe Perner NT (1994)

Alistair Phillips, Vic (1994)

Plantique, NSW (1995)

J Playford, Qld (1994)

Brian Quinn, Vic, (1995)

Brett Robinson NSW (1994)

Esma Salkin; Vic (1995)

Sarah Sharp (1995)

Mel Sheppard, ACT (1994)

Marilyn Smith, NSW, (1994)

Howard Smith, NSW (1994)

Diana Snape, Vic (1995)

JH & I E Story, Qld (1995)

Joe Swartz, NSW (1995))

D Swift, Tas (1994)

Jane Tarran, NSW, (1994)

Roy Taylor, USA (1994)

Technical Librarian, Qld (1994)

Megan Thomas, Qld (1994)

Phillip Thomas, RBG Edinburgh (1994)

Lyn Thompson NSW (1994)

Jan Tilden, Qld (1995)

Bindi Vanzella, NSW (1994)

Darren Wallace, Vic (1994)

Bruce Wannan, NSW (1995/6)

Chris Ward, NSW (1994)

Matt White, Vic (1995))

John Wilkes, ACT (1994)

Jann Williams, ACT (1995)

ME Williams, Qld (1995)

J & A Willinck, NSW (1995)

John Wrigley; NSW (1995)

Martin Zierholtz, Germany (1995)

Donations Received from:

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E George

W McDonald

Plantique

J&A Willinck

Martin Zierholtz